Quaternary Geology of the Yukon Territory
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The glacial history of Yukon Territory is unique in Canada. The rest of Canada was almost entirely covered by glacial ice during the last ice age (Late Wisconsin - 25,000 to 10,000 years B.P.), but much of the Yukon was free of ice (Fig. 1). The region extending from the central and northern Yukon across Alaska and westward to northern Asia was a vast ice-free wilderness across which herds of now extinct grazing mammals and their predators roamed. Horses, camels, lions, mammoths, to name a few, survived in this ice-free area more correctly called a refugium. The Bering Sea did not exist at that time because sea level was more than 100 m lower than that of today. This lower sea level was caused by the fact that great quantities of water were tied up on the land as continental ice sheets. This ecological ice free region is called Beringia after the now submerged Bering land bridge between Asia and North America. The first people to enter the Americas entered through Beringia.

Although the earliest known glaciation in the Yukon occurred about one billion years ago, during the late Precambrian Era, it was the events of the past 65 million years, the Cenozoic era that shaped the landscape of the Yukon.

During this period, prolonged weathering and erosion defined the plateau areas of central Yukon. A well developed system of smooth, rounded summits and valleys formed as a mature landscape, with streams draining in a southerly direction. In late Cenozoic, after this period of geologic stability, the region was slowly uplifted and this continued into the Quaternary time period (2 million years to present). Drainage systems carved extensive valley systems. While the plateau region of central Yukon was being gently elevated (millimetres per thousands of years), the St. Elias Mountains in the west were being rapidly uplifted (metres per thousands of years).

By about 8 million years ago, they were high enough for glaciers to form. These left distinctive deposits in what is now the White River valley.

During the Pleistocene epoch (about the last 1.65 Ma), an ice sheet called the Cordilleran Ice Sheet advanced from the mountains into central Yukon at least six times. These glaciations were separated by tens of thousands of years during which the climate was similar to the one we are experiencing now or even milder. Soils developed during the warmer periods. These soils are locally preserved between glacial deposits. They are easy to recognize because they are thicker and redder than the soils that formed since the last ice age. These soils are used to subdivide and correlate glacial deposits across central Yukon. This climatic roller coaster of cold glacial periods alternating with warmer interglacial periods is caused by variations in the earth's orbit and its angle of rotation with time. Each major warm-cold cycle lasted about 100,000 years.

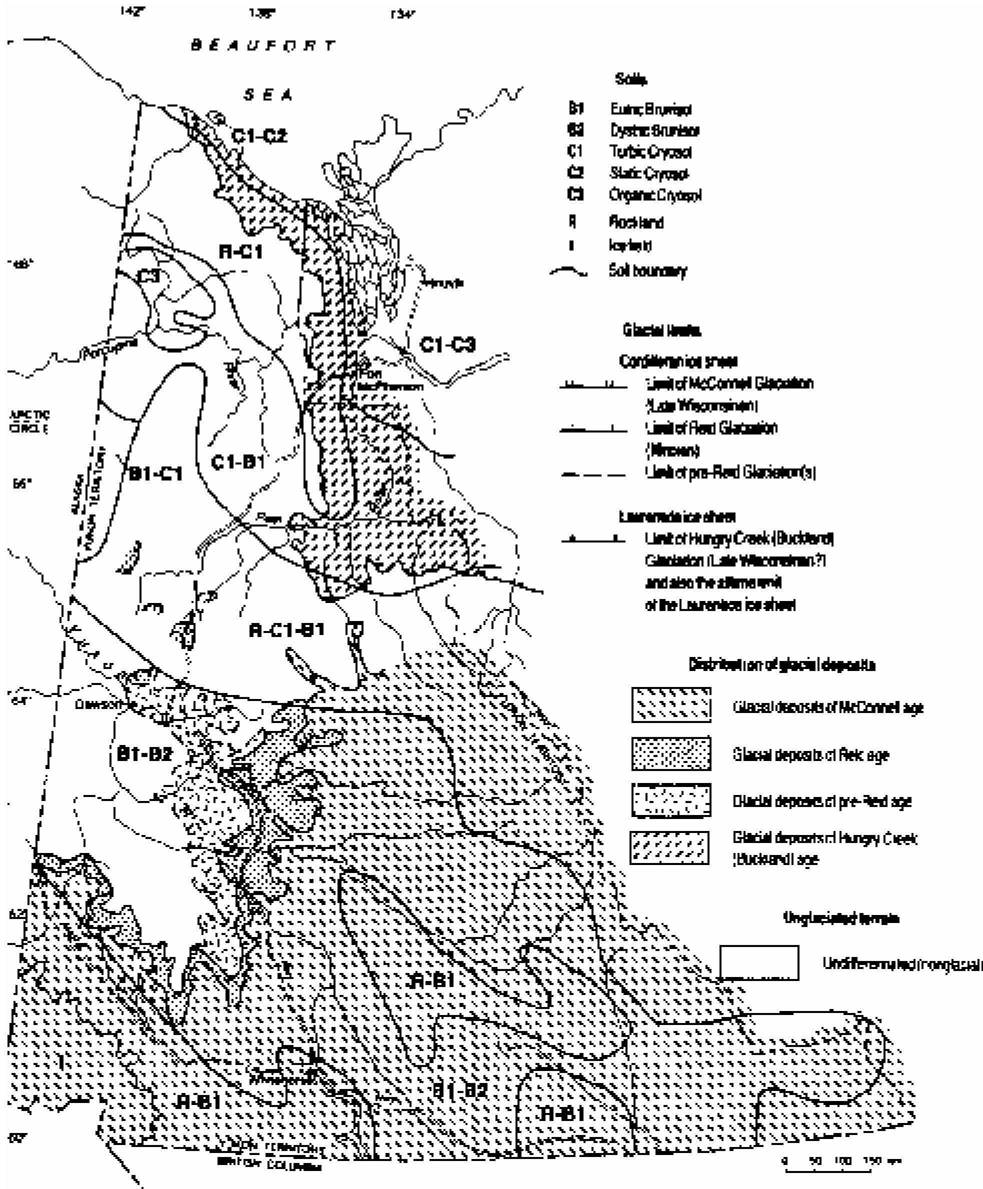

Figure 1. *Distribution of recent soils and glacial limits in the Yukon (Morison and Smith, 1987).*

Till underlies many of the valley deposits in the glaciated regions. Subsequent to the disappearance of the glaciers, river and slope processes modify the variety of deposits. Rivers flowing away from glaciers leave thick and broad expanses of gravel. Ice sheets dam drainages and create huge lakes. The white cliffs around Whitehorse are composed of silts from such a lake, called glacial Lake Champagne. Debris melting directly from ice forms sediment called till with boulders set in mud much like fruit in fruitcake. This paraglacial period is marked by an abundance of unconsolidated material available for erosion and redeposition. Wind blown deposits (loess and sand dunes) derived from the rock flour produced by glaciation occur over some valley bottoms and terraces.

Besides eroding the rocks and leaving distinctive deposits, glaciers have changed the landscape in other ways. In many places, the flow of glacial ice was in a direction opposite to that of the flow of major rivers such as the Yukon. The original flow of the Yukon River was to the south. Glacial diversion caused it to reverse flow direction and it now flows northwest and west through Alaska.

The chronology of Pleistocene Cordilleran Ice Sheet advances are reconstructed based on fragmentary evidence. For example, at Fort Selkirk in central Yukon, lava beds as old as 1 million years have unconsolidated glacial deposits both above and below them.

The most recent widely distributed volcanic ash is the White River Ash. It actually occurs as two ash beds (Figure 2), an older north trending lobe (1400 yr.) and a younger (1250 yr.) east trending lobe. Other tephras of Pleistocene age include the Old Crow tephra approximately 150,000 years old, the Mosquito Gulch tephra (1.22 million years old) in the Bonanza Creek drainage, and the Sheep Creek Tephra from Ash Bend, Stewart River also about 150,000 years old. A recently dated tephra in the Klondike area dates the White Channel gravel, an important gold bearing formation, at 2.7 million years.

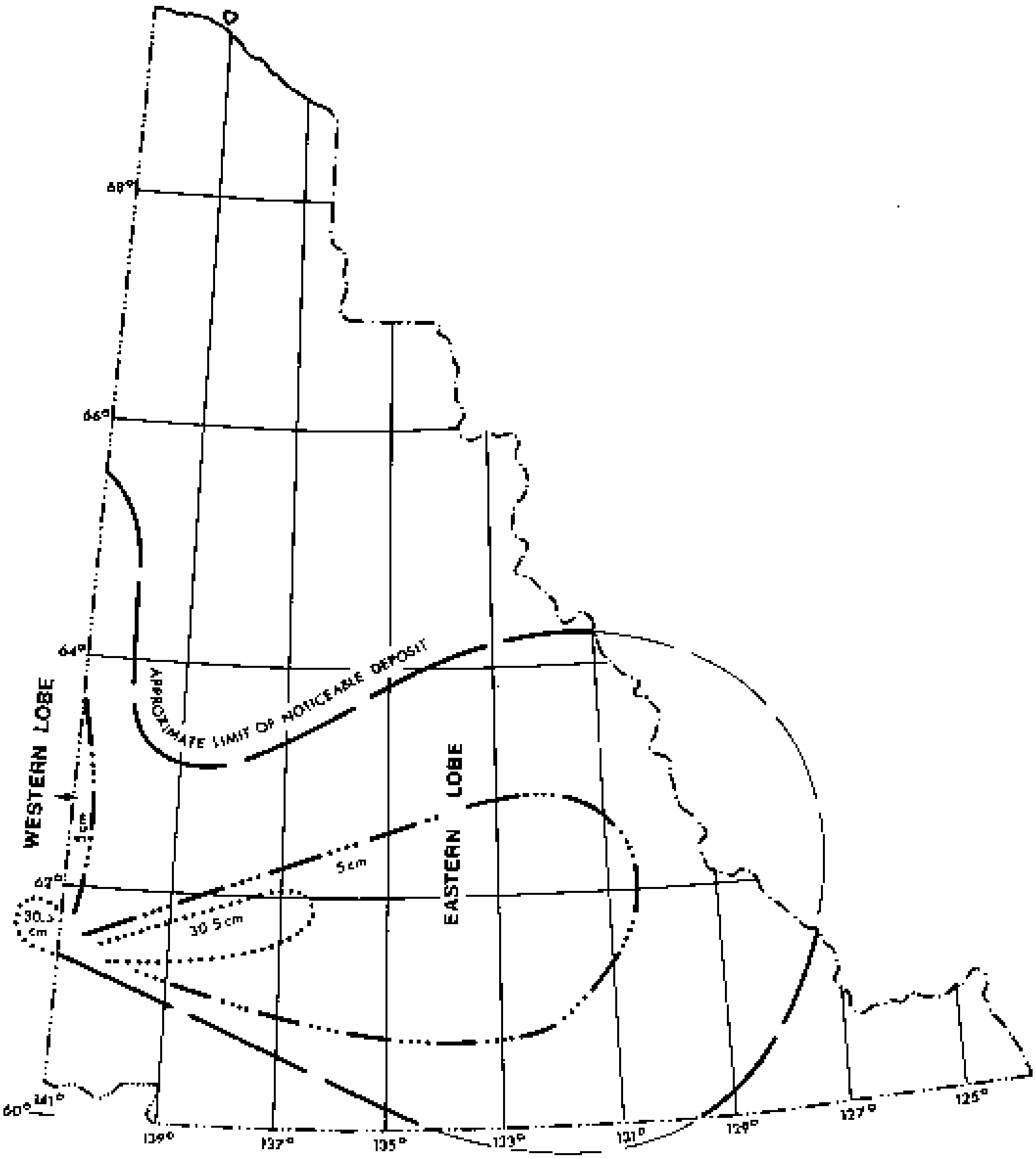

Figure 2. *Approximate extent and depth of White River volcanic ash (Oswald and Senyk, 1977).*

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